



USAFEA Discovery

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USAFEA Discovery is published quarterly by the faculty of the US Air Force Academy (USAF). It contains reports on USAFA cadet and faculty research, a complete list of current USAFA research points of contact, and a summary of recent awards and publications. All written material contained within reflects the opinions of the authors and editors and does not necessarily reflect current US Air Force or USAFA policy.

A Bird Avoidance Model for the US Air Force



The result of a collision between a turkey vulture and the leading edge of a C-130 wing.

The United States Air Force reports approximately 3,000 bird strikes to its aircraft each year. These incidents have resulted in more than 20 lost aircraft, 33 fatalities, and over \$500 million in damages in the last decade. The USAF Bird Aircraft Strike Hazard (BASH) program specifically addresses techniques and technologies to reduce or eliminate these bird strikes through a wide variety of means. Manufacturers design and test aircraft components to withstand impacts better on modern mission profiles. Control of birds around airfields involves habitat management, active harassment programs, and population control measures. Improved mission profiles avoid hazardous concentrations of birds during low level and range operations. Although bird strikes can occur during any phase of flight, the majority of damages and catastrophic incidents occur on low level and range missions. In these environments bird avoidance is the only option to reduce the hazards.

In the mid 1980s, the USAF BASH Team developed a Bird Avoidance Model (BAM) to enable route designers, flight planners, schedulers, and aircrews to choose the safest areas and flight schedules to reduce bird strikes. That early model included a few of the most hazardous species of

birds and was relatively coarse in its geographic resolution. While the old model allowed planners to make decisions on a broad scale, it only allowed limited local flight planning decisions.

Following the crash of an AWACS aircraft at Elmendorf AFB in September of 1995, the Air Force Chief of Staff asked for new measures to be taken to reduce the often-severe bird strike hazard to various AF operations. He dedicated funding through the Air Force Safety Center and the BASH Team to develop an improved Bird Avoidance Model for the continental U.S. That funding, along with contributions from several other agencies and major commands, was granted to the USAF Academy in a collaborative effort to research and develop a new BAM. The Departments of Biology (DFB) and Economics and Geography (DFEG) worked together to develop this model. The latest version of the BAM is now complete and was delivered in May 1998 to the USAF Safety Center's Bird Aircraft Strike Hazard Team. The new BAM is a Geographic Information System (GIS) based program that will be available in a Personal Computer format for use by any safety, operations, and engineering function with flight planning or scheduling responsibilities. It will also be available on-line through the Safety Center's Web site. The new BAM incorporates all U.S. bird species considered hazardous to safe flight.

The research protocol generally follows procedures developed as part of an AF-sponsored Ph.D. program by Lt Col Russell DeFusco (DFB) in an earlier study to determine the feasibility of such a large-scale effort. That study demonstrated a successful model of bird distribution and abundance over a continental scale and provided predictive risk surfaces for flight planning efforts. Available historical data on breeding, wintering, and

migrating bird distributions and abundance patterns are overlaid on a wide variety of environmental factors to predict the overall risk of encountering hazardous birds for each square kilometer of the U.S., for each two week period of the year, and for four different periods of the day. Combined with detailed geographic data such as jurisdictional boundaries, aeronautical charts, infrastructure, and land use patterns, the user can select multiple themes to display for planning purposes.

Detailed information allows localized flight planning decisions to minimize the risk to flight safety. While the overall research effort was enormous due to the vast area of coverage and the huge data sets involved, the end product is a simple menu-driven program that graphically depicts a color-coded, relative risk surface of bird densities and potential for strikes for any chosen location. These can be compared to

In this issue:

- **Lead articles:** Bird Avoidance Model, AC-130 Gunship Drag Reduction, Institute for National Security Studies, Institute for Information Technology Applications (pgs 1-4)
- Department Research news (pg 5)
- Publications and Presentations (pgs 5-7)

This issue marks the departure of two of the editors, Capt Jessica A. Bertini and Lt Col Donald R. Erbschloe. Capt Bertini will become the Chief of Services, Air National Guard at Andrews Air Force Base. Lt Col Erbschloe is tagged to be the Military Assistant to the Chief Scientist of the Air Force. His replacement, Lt Col Larry D. Strawser, will take over as the Academy's Director of Faculty Research.

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any other location and any other time frame so that the safest locations and times for completing a mission can be easily selected. The output of the current model has already been used following two USAF aircraft accident investigations to alter operations and reduce potential future hazards.

The work done to date on this project has been enormous. The Department of Geography accomplishes most of its work under contract in its Integrated GIS Lab. A large number of federal, state, and local agencies contributed data sets to the effort. The work is still in progress and maintenance and updates to the model will continue in the future. Additionally, the effort is becoming international in scope. A researcher from Tel Aviv University in Israel spent four months at the USAFA learning the modeling techniques. She took the procedures home to develop a compatible model for the Middle East and European regions. Ultimately, the BASH Team hopes to develop Bird Avoidance Models for all areas of the

globe where the Air Force conducts its operations. Indeed, after seeing preliminary versions of the BAM, representatives from Alaska and Europe have requested similar models be developed for their theaters of operations. Pending funding, we will continue the efforts here at the USAFA beginning next fall. With the new continental U.S. BAM and future models in place, we hope to make the skies a little safer for those who share them with the birds. The payoff in saved resources and, more importantly, aircrew lives is crucial to maintain our fighting force.

For more information, contact the principal investigator:

Lt Col Russell P. DeFusco

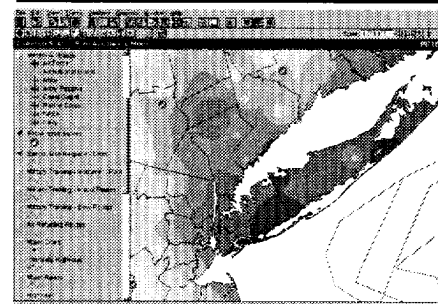
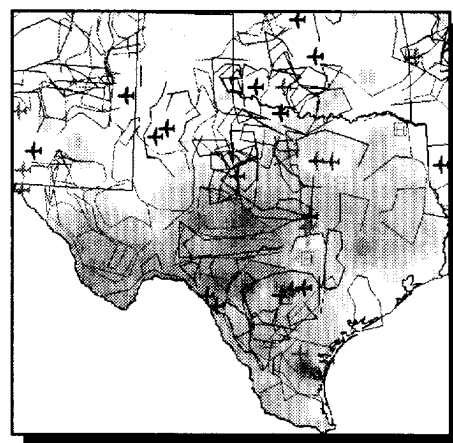
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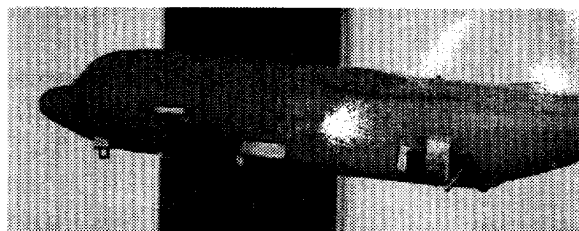
The BAM personal computer interface: interactive menus and easy-to-read maps.

AERONAUTICAL RESEARCH CENTER LEADING EFFORT TO IMPROVE OPERATIONAL CAPABILITY OF AC-130U GUNSHIP

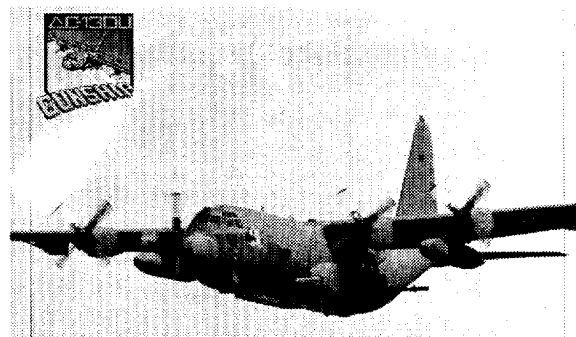
The Aeronautical Research Center has accomplished over 300 hours of wind tunnel testing during the past two years to design and develop drag reduction modifications for the newest gunship in Air Force Special Operations Command (AFSOC)--the AC-130U. Currently, operational crews are concerned about the additive drag resulting from external modifications to the aircraft such as avionics/fire control housings and weapon installations. This additive drag reduces loiter time and increases IR signature due to the higher thrust needed. The program began in the fall of 96 and has involved five separate phases of testing using the Subsonic Wind Tunnel in the Aeronautics Laboratory. Seven modifications have been designed and optimized which have the potential to reduce the additive drag by over 50%. Fuel savings have been projected at over \$2 million for the life of

the gunship fleet. In addition, the Department of Engineering Mechanics has provided structural assistance for selected modifications.

The overall effort was reviewed recently by the AFSOC Commander, who praised the results. Flight testing of USAFA-designed modifications on an AFSOC AC-130U is the next step in allowing the modifications to be installed on the AFSOC gunship fleet. Additionally, Warner Robbins Air Logistics Center recently approved funding for the Aeronautical Research Center to conduct a similar effort on the AC-130H. Dr. Tom Yechout of the Department of Aeronautics is the Principal Investigator and Mr. Ken Ostasiewski is the wind tunnel technician. 19 cadets have been involved in this program during the past two years.



USAFA faculty and cadets use the model above to demonstrate reduced drag on the AC-130U gunship.



USAFA has several key research programs and resources. In the last issue we gave readers an overview of our research centers. In this issue we introduce two important assets—our research-related institutes. We focus on the Institute for National Security Studies (INSS). The mission of the INSS is “to promote national security research for the Department of Defense within the military academic community and to support the Air Force national security education program.” We follow with a short description of our second institute, the Institute for Information Technology Applications (IITA), as well as some upcoming events. The IITA is brand-new and we will devote a longer article about it in a future issue of the *USAFA Discovery*.

The Institute for National Security Studies

The USAF Institute for National Security Studies (INSS) is a “virtual” research center located at USAFA that manages research projects on a wide range of defense policy issues. It is a virtual research center because INSS projects are accomplished by volunteer researchers from across the military academic community rather than by an in-house research staff. INSS is sponsored by Department of Defense organizations that want research done on topics of current interest and provide funding to support this research. INSS works with its sponsors to develop research topics, select volunteer researchers, manage the research projects, and publish the best research products. INSS’ primary sponsors are the Policy Division of the Nuclear and Counterproliferation Directorate on the Air Staff (HQ USAF/XONP) and the USAFA Dean of the Faculty. Other sponsor organizations currently include: the Intelligence, Surveillance, and Reconnaissance Directorate on the Air Staff (HQ USAF/XOI); the Defense Special Weapons Agency; the Army Environmental Policy Institute; the Secretary of Defense’s Office of Net Assessment; the On-Site Inspection Agency, and the Plans Directorate of United States Space Command. In addition, the Air Staff’s Strategy and Policy Division of the Strategic Planning Directorate (HQ USAF/XPXS) has provided INSS with a National Defense Fellow each year, and the International Research and Exchanges Board (IREX) started a fellowship program at INSS beginning in 1997.

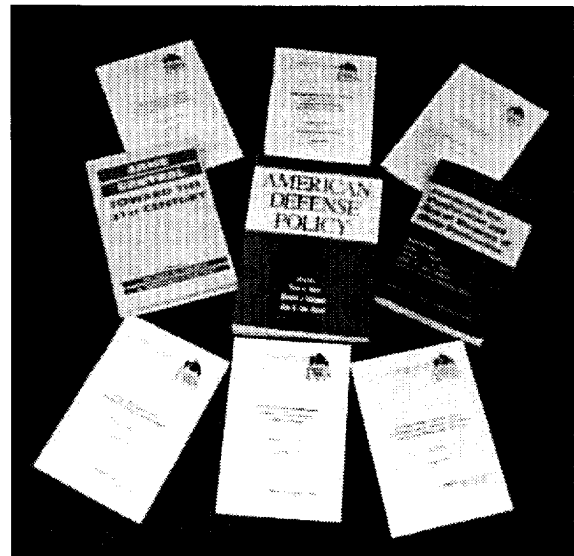
From its inception in 1994, INSS has offered several advantages to our sponsors: providing maximum return for scarce research dollars; injecting fresh thinking into the Washington planning process; tapping the skills and knowledge within the military academic community; creating a pool of topical and regional experts; providing a means for educating the Air Force on these issues; and acting as a networking locus to bring together people and ideas. The benefits INSS brings to the research organizations and individuals conducting our research are equally important. INSS research grants enhance an officer’s professional development, providing him or her with direct access to real world issues of importance to the Department of Defense. Moreover, it provides sorely needed research funding to schools and institutes, gives the individual researchers professional contacts, the potential

for publication, and the opportunity for short-term temporary duty tours and follow-on assignments.

INSS Research Topics

- Arms control
- Counterproliferation
- National Security
- USAF Policy
- Information Warfare
- Environmental Security
- Space Policy
- Regional Studies
- Revolution in Military Affairs

During 1997-98 Academic Year, INSS continued to strengthen its program in a number of areas. We worked with a variety of new potential sponsor organizations in order to diversify our sponsor base and to make a wider range of topics available to our researchers. McGraw-Hill recently published the third book edited by the INSS staff, *Countering the Proliferation and Use of Weapons of Mass Destruction* (edited by Pete Hays, Vince Jodoin, and Alan Van Tassel). The book is based on the INSS topical conference held at National Defense University in July 1997 and should be a significant contribution to the academic literature that addresses America’s greatest security challenge of the post-Cold War era. The INSS website (<http://www.usafa.af.mil/inss>) was completed in late 1996



Some of the many INSS products

and has since had over 9,000 visits. Our website is a powerful communication tool that allows us to publicize INSS research abstracts to potential researchers more effectively than ever. The INSS website also allows us to serve our sponsors and other users better by making all of our Occasional Papers and many research reports immediately available via the Internet. INSS was honored to have Major General Thomas Neary and Mrs. Joanne Linhard present the first annual Linhard Award for outstanding research to Captains Stephen Lambert and David Miller of USAFA's Military Art and Science faculty at the banquet for the November 1997 Research Results Conference. Finally, during the last year INSS released Occasional Papers numbers 12 through 19 and laid the foundation for the 29-30 July 1998 topical conference and the next INSS edited book, *Spacepower for a New Millennium: Space and U.S. National Security* (edited by Pete Hays, Jim Smith, Alan Van Tassel, and Guy Walsh).

Of course, many organizations and individuals deserve credit for the success of INSS thus far, including the outgoing Dean, Brigadier General Ruben Cubero, the Director of Education, Colonel Randy Stiles, and the logistical, administrative, and especially research support from all of the USAFA faculty. We also have benefited from the expertise of the Graphic Arts Division of the 10th Communications Squadron; the DF and Academy finance offices; the Defense Printing Plants in Fairchild and Harmon

Halls; the Government Printing Office plant in Pueblo; the Academy Public Affairs and Protocol offices; and the Fairchild Hall building manager and associated service agencies. The Directorate of Education gives INSS an organizational home and outstanding administrative support.

If you are interested in INSS' research products or in submitting a research proposal to us, please see any staff member in Fairchild Hall, room 5L27, call us at (719) 333-2717, or visit our website (<http://www.usafa.af.mil/inss>). The current staff includes outgoing director Lt Col Pete Hays, incoming director Dr. Jim Smith, National Defense Fellow, Lt Col Guy Walsh; deputy director, Maj Vince Jodoin; and our Budget Assistant who holds everything together, Ms. Diana Heerdt.

Submitting a Research Proposal to INSS

If you are interested in performing research for INSS, please consult the research abstracts we have developed and submit proposals using the memorandum format listed in the *INSS FY99 Research Program Guide* and on our website. INSS also welcomes proposals on topics not listed as abstracts but that may be of interest to our sponsors. The deadline for first round submissions is 9 October 1998.

Vision

To be the Air Force institute of choice for promoting, coordinating, and disseminating vital national security research that influences DoD policy development.

The Institute for Information Technology Applications

The institute seeks to enhance research and dialogue in information technology (IT) applications at USAFA and within DoD. For external projects, IITA intends to leverage USAFA's multi-domain experience and common scientific framework to address IT needs identified by external clients. In addition to research, IITA will play a coordinating role by conducting conferences on technology issues. Internal to USAFA, IITA seeks to support educational information technology work of common interest to a number of Academy departments and agencies. In both roles, the institute aims to become a virtual clearinghouse of IT expertise providing financial, technical, conceptual, and other services to bring researchers and needs together.

To learn more about the IITA, contact one of the Deputy Directors, Lt Col Brian Cullis (CullisBJ.dfe@usafa.af.mil) or Lt Col Earl McKinney (McKinneyE.dfe@usafa.af.mil).

Upcoming Events and Announcements:

The Electronic Enterprise Endeavor: A conference to be held this September at USAFA. This meeting will address the Defense Reform Initiative to move Air Force toward a paperless enterprise. Anticipated speakers include the Deputy Secretary of Defense, the Air Force CIO, and the Director of AFCA.

IITA Research Grants: The IITA will be soliciting projects for funding later this summer. Look for announcements regarding topics and proposal formats.

New Information Technology Laboratory: A new facility is under construction in Fairchild Hall at USAFA. It will be located next to the existing Network Classroom.

Department News

Department Of Astronautics

Hybrid Rocket Research

The focus of this research is to investigate and develop the necessary hybrid rocket technologies to produce a repeatable rocket design, build, test, and fly academic program. The goals are to understand, simulate, design, build, and test hybrid motors, and possibly use a cadet designed/built motor on a small satellite project. Part of this included flying off-the-shelf hybrids (Aerotech) in some cadet built rockets. During spring '98, a department built hybrid was flown at Ft Carson (one of the first hydrogen peroxide/polyethylene hybrids flown). Next academic year's efforts will focus on flying similar motors in Engineering 433 in the fall, in which cadets will take this motor and customize it for their launches.

With this research we are able to involve cadets in hands-on design, manufacture, testing, and flying of exciting rocket hardware. More than just equations in a book, this project allows faculty and cadets to apply what they've learned. Also, "real-world" problems always arise which must be solved, again providing a great learning experience. Long term, this research will allow development of a space hybrid engine to be used with the USAFA Small Satellite Program.

34th Education Group

As the Academy moves into its summer routine, many of the 34th Education Group faculty are stepping up their research efforts. With INSS funding, Charles Krupnick is continuing his work on the problems associated with Russian nuclear waste and international cooperation; Capt Stephen P. Lambert is investigating the issues associated with NATO enlargement; and James M. Smith is continuing his investigation of service cultures and identities, adding the additional issue of service academy development. With INSS and DF funding, Major Boyd Brown is examining the Japanese business intelligence-gathering system and its impact on the US defense technology base. In a collaborative effort with Capt. A. Timothy Chamillard of the Computer Science Department, Dolores M. Karolick is collecting and analyzing data to establish the relationship between student learning styles and student performance. Results could lead to proposals for change in instructional strategies and student project design.

Work on dissertations and publications is continuing as well, with Lt Col Eric A. Ash completing inputs to his book *Sir Frederick Sykes and the Air Revolution* and Major Kurt M. Schake preparing to defend and publish his research on the origins of US Air Force Strategic Air Command basing arrangements in Europe entitled, "Strategic Frontier: American Bomber Bases Overseas, 1950-1960." Closer to home, Capt William A. Ward is progressing on his dissertation on the policies and programs for long-term health care of the elderly and infirm.

Publications and Presentations

Department of English

Publications:

BLAKE, D.H. "11 Games for the End of the 20th Century." *Fiction International* Summer 1998.

BLAKE, D.H. "Richard Wilbur and World War II." *The Richard Wilbur Society Newsletter* Summer 1998.

DOOLEY, P.K. *Newsletter of the Society for the Advancement of American Philosophy* January 1998. (Editor)

MEREDITH, J.H. Review of "Hemingway: The Postwar Years and the Posthumous Novels by Rose Marie Burwell." *Modern Fiction Studies* 43.2.

MEREDITH, J.H. "Calculating the Complexity in Ernest Hemingway's *Across the River and into the Trees*." *North Dakota Quarterly* 64.3.

MEREDITH, J.H. *War, Literature, & the Arts* Spring/Summer 1997. (Guest Editor)

MITCHELL, V.D. "African-American Perspectives and Philosophical Traditions." *Society for the Advancement of American Philosophy Newsletter* October 1997.

NOE, M.D. "Crossing the Line in 'A Cross Line': The Frontier in George Egerton's Short Fiction." *Selected Papers—1997 Conference of the Society for the Interdisciplinary Study of Social Imagery*.

NOVAK, K.P. "Antiques." *roofbeam magazine* Spring 1998. (Fiction)

RICE, R.P. "Four Years with General Lee." *War, Literature, and the Arts* Spring/Summer 1997.

Presentations:

ANDERSON, D.C. "Teaching the Vietnam War." Northeast Modern Language Association, Baltimore MD, April 1998. (Invited Speaker)

BERTINI, J. "Returning the Stare." Society for the Interdisciplinary Study of Social Imagery Conference, Colorado Springs CO, 12-14 March 1998.

BOWIE, T.G., Jr. "Every Day I'm Always on Patrol: Bill Ehrhart's Journey Home." Popular and American Culture Association Conference, Orlando FL, 10 April 1998.

BRALEY, M. "The Gulf in Gulf War Fiction." Popular Culture Association and American Culture Association Annual Conference, Orlando FL, 11 April 1998.

DOOLEY, P.K. "Creating Community: Josiah Royce and John Steinbeck." Annual Meeting of the Society for the Advancement of American

Philosophy, Marquette University, Milwaukee WI, 6 March 1998.

HARRIS, W.J. "Phillis Wheatley and the Creation of an African Colonial Literary Persona." College Language Association Convention, Tallahassee FL, 16 April 1998.

KRISE, T.W. "Pure Empire: Justifying Slavery and Genocide in the West Indies." American Society for Eighteenth-Century Studies, Notre Dame IN, 1 April 1998.

LUKER, G.M. "Proud to Serve: Redefining the Role of Service in Composition Studies." Conference on College Composition and Communication, Chicago IL, 1-4 April 1998.

MEREDITH, J.H. "Teaching the Literature of the Vietnam War." The Northeastern Modern Language Association, Baltimore MD, 17 April 1998. (Panel Chair)

MEREDITH, J.H. "The Night Before Chancellorsville," Fitzgerald, and Historical Fiction." Northeastern Modern Language Association, Baltimore MD, 18 April 1998.

MEREDITH, J.H. "The European Theater of Operations and Hemingway's Intimation of a New Aesthetic." 8th International Hemingway Conference, Les Sainte-Marie-de-la-Mer, France, 25-31 May 1998.

MITCHELL, V.D. "Helene Johnson: The Early Years." College Language Association Convention, Tallahassee FL, 17 April 1998.

NOE, M.D. "George Egerton's 'An Empty Frame' and New Woman Compromise." Fourth Annual Marquette University Women's Studies Conference, Marquette University, Milwaukee WI, March 1998.

NOE, M.D. and David E. Fitzkee. "The Ignored Relation: *Black-Eyed Susan* as a Source for *Billy Budd*." Creighton Conference on Language and Literature, Omaha NE, March 1998.

SHUTTLEWORTH, J.M. "Prolegomena to the *Oxfordian Shakespeare*." DeVere Studies Conference, Concordia University, Portland OR, 2-5 April 1998.

SWARTZ, H.M. "Reconciliation in Shakespeare's Comedies." Fourth Annual Conference of the Association for Core Texts and Courses, Asheville NC, 20 April 1998.

Department of Management

Publications:

BAKER, S.F., and 9 others colleagues. "Application and Extension of the Throughput II Optimization Model for Airlift Mobility." *Journal of Military Operations Research* 3.2: 55-74.

CAMPBELL, R.A., M. Fekula, and M.R. Weeks. "Classical-Jazz-Rock & Roll: Variation on Organizational Style." *Proceedings of the American Society of Business and Behavioral Sciences* Vol. 7 (February 1998): 164-167.

FEKULA, M., R. Campbell, and M.J. Hornyak. "Organizational Overhead: The Increasing Effort Toward Mission Neglect." *Proceedings of the American Society of Business and Behavioral Sciences* Vol. 2 (February 1998): 162-165.

GAINES, D.A., S. Green, and K.A. Heppard. "MILSTAR Program Change: Decision-Making in Cyber-Space." *Proceedings of the Western Casewriters Association* (March 1998).

HORNYAK, M.J. and M.J. Fekula. "Atoning for Past Sins: A Contingency Perspective for Total Quality Management (TQM)." *Journal of Business and Behavioral Science* 3.2: 1-9.

HORNYAK, M.J., K.J. Davis, and D.A. Gaines. "The Retrenchment Process: A View from Three Strategic Orientations." *Proceedings of the American Society of Business and Behavioral Sciences* (February 1998): 70-81.

LOWE, J.K. and M. R. Weeks. "Quick Response Simulation: Laughlin AFB Capacity Analysis." *Phalanx* 31.1: 10-31.

THORNTON, J.M. and Dr. B.K. Peterson, (Montana State University). "Application of the 'Fraud Triangle' to Students' Classroom Ethics." *Accounting Perspectives* Fall 1997.

WEEKS, M.R. and K.J. Davis. "Controlling the Future: Transacting in Cyberspace." *Proceedings of the American Society of Business and Behavioral Sciences* (February 1998): 196-204.

WEEKS, M.R. "Rush Hour at 10,000': USAF Capacity Analysis." *Proceeding of the Western Decision Sciences Institute* April 1998.

Presentations:

BARKER, J.R. "Writing from the Non-Participant Observer Point of View." Western States Communication Convention, Denver, February 1998.

CAMPBELL, R.A., M. Fekula, and M.R. Weeks. "Classical-Jazz-Rock & Roll: Variation on Organizational Style." American Society of Business and Behavioral Sciences, Las Vegas NV, February 1998.

GAINES, D.A., M.J. Hornyak, and K.J. Davis. "The Retrenchment Process: A View from Three Strategic Orientations." American Society of Business and Behavioral Sciences, Las Vegas NV, February 1998.

GAINES, D.A., S.G. Green, and K.A. Heppard. "MILSTAR Program Change: Decision-Making in Cyber-Space." Western Casewriters Association, Portland OR, March 1998.

FEKULA, M.J., R.A. Campbell, and M.J. Hornyak. "Organizational Overhead: The Increasing Effort Toward Mission Neglect." American Society of Business and Behavioral Sciences, Las Vegas NV, February 1998.

LEE, D. "Republic of Korea Tanker Study," DFM AY97/98 Research Review, USAF Academy, April 1998.

STRBIAK, C.A. and R. Blass. "Cognitive Structures." DFM AY97/98 Research Review, USAF Academy, April 1998.

THORNTON, J.M. and Dr. B.K. Peterson (Montana State University). "Ethics in Ambiguous Academic Situations: An Exploration of the Effect of Integrated Ethics Education on Student Perceptions & Rationalizations." KPMG Peat Marwick Research on Accounting Ethics Symposium, Bryant College RI. June 1997.

THORNTON, J.M. "God Scores a '4' on the DIT: Arguments for Lower Stages of Ethical Development as Optimal for the Public Accounting Profession." 1998 Western Region American Accounting Association Meeting, Seattle WA, April 1998.

THORNTON, J.M. and Dr. B. K. Peterson, (Montana State University). "Application of the 'Fraud Triangle' to Students' Classroom Ethics." 1998 Western Region American Accounting Association Meeting, Seattle WA, April 1998.

THORNTON, J.M. and Dr. B.K. Peterson, (Montana State University). "Teaching a Professional Code of Conduct at the Collegiate Level." The Northwest Accounting Research Group, Post Falls ID, April 1998.

THORNTON, J.M. and Dr. B.K. Peterson, (Montana State University). "Application of the 'Fraud Triangle' to Students' Classroom Ethics." The Northwest Accounting Research Group, Post Falls ID, April 1998.

WEEKS, M.R. and K.J. Davis. "Controlling the Future: Transacting in Cyberspace." American Society of Business and Behavioral Sciences, Las Vegas NV, February 1998.

WEEKS, M.R. "Rush Hour at 10,000": USAF Capacity Analysis." Western Decision Sciences Institute, Reno NV, April 1998.

Consultations:

ARTEAGA, K.R. and D. Stewart. Personal Estate Planning briefings to the general military populations at Hurlburt AFB FL, Eglin AFB FL, November 1997 and Langley AFB VA, April 1998.

ARTEAGA, K.R. "Financial Responsibility." College of Enlisted PME, Maxwell AFB AL, November 1997.

BARKER, J.R. and K.D. Davis. "Organizational Change Assessment." Los Alamos National Laboratory. (Ongoing)

DAVIS, K.J. and S.G. Green. "Outsourcing Alternatives for Future Air Force Accounting Information Systems." Defense Finance and Accounting Service, Denver CO. (Ongoing)

GREEN, S.G., K.J. Davis, K.A. Heppard, and J.E. Parco. "Extreme Competitive Advantage Through Technology Innovation." Consultation with Lockheed-Martin Advanced Aircraft Division. (Ongoing)

GREEN, S.G., K.J. Davis, and D.R. King. "Depot Outsourcing Cost Analysis." SAF/FM. (Ongoing)

LOWE, J.K., M.R. Weeks, and C1C B. Rizzoli. "Laughlin Sortie Generation Consultation." Laughlin AFB TX. (Ongoing)

LOWE, J.K. "Airport Customer Service Analysis." Airport Manager and City of Colorado Springs. (Ongoing)

Department of Mathematical Sciences

Publications:

BODENSCHATZ, C. D. and J. R. Simpson. "Analytical and Statistical Consulting for the Armament Directorate." *Mathematica Militaris* 8.1.

CROCKETT, C. E. "Why Use Radians in Calculus?" *The AMATYC Review* 19.2.

EMSLIE, P. D. and J. D. Hetzer (Cadets First Class). "Modeling the Distribution of Chaotic Orbits." *Mathematica Militaris* 8.1.

HADFIELD, S. M. "Testbank 3.1 User's Manual." USAFA TR-97-9. (Technical Report)

KLINE, B. "Fishing for Connections: Integration by Parts." *Colorado Mathematics Teacher* January 1998.

PARKER, M. R. and J. K. Lowe. "Cadets as Consultants--Operations Research at USAFA." *Mathematica Militaris* 8.1.

REVAK, M. A., S. M. Hadfield, and R. A. Yelle. "Academic Testing Meets Operational Readiness." *Mathematica Militaris* 8.1.

WARNER, B. A., D. Pendergraft, and T. Webb. "That was Venn, This is Now." *Journal of Statistics Education* 6.1.

WARNER, B. A. and J. Rutledge. "A Comparison of Intervals." USAFA TR-98-1. (Technical Report)

Presentations:

PARKER, M. "The Professor at Stage Left: Becoming a Facilitator in the Classroom." CU-Denver Mathematics Teaching Colloquium, 2 February 1998.

REVAK, M. A., and B. Kline. "A Calculus Variety Pack." National Council of Teachers of Mathematics Annual Meeting, Washington DC, April 1998.

SJODEN, G. "3D Shielding Benchmarks." Commisariat a'L'E'nergie Atomique Conference on Parallel Transport, Paris, March 1998.

SJODEN, G. "MPI on IBM SP2." Commisariat a'L'E'nergie Atomique Conference on Parallel Transport, Paris, March 1998.

SJODEN, G. "Parallel Sn Code Architecture." Commisariat a'L'E'nergie Atomique Conference on Parallel Transport, Paris, March 1998.

SJODEN, G. "Presentation of PENTRAN Code." Commisariat a'L'E'nergie Atomique Conference on Parallel Transport, Paris, March 1998.

Department of Physics

Publications:

ANDERSEN, G. and R.J. Knize. "Holographically corrected microscope with a large working distance." *Applied Optics* 37.

BLOOMER, R., C. Wetterer, A. Mumpower, D. Caton, and C. Lloyd. "CCD Photometry of V1147 Cyg." *Information Bulletin on Variable Stars* No. 4568.

MURPHY, K.L. and E.T. Patterson. "Mars Global Surveyor Aerobraking in the Physics Classroom: A Collaborative Team Approach." *The Physics Teacher* March 1998.

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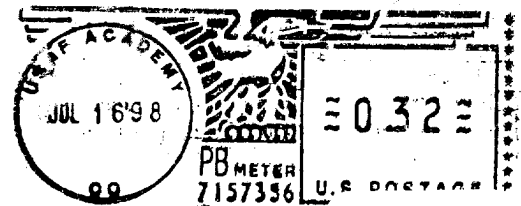
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